

# Green Stormwater Solutions Project

**Grade:** 6-8

**Discipline:** Science

**Length:** About 2-3 weeks depending on length of classes

## Targets:

MS-ESS3-4	Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

## Essential Question(s):

1. How can we use engineering and design to solve problems caused by stormwater runoff?
2. How do increases in human population impact our natural resources and impact our Earth's systems?

**Objective:** Students will take their learning about nonpoint source pollution and runoff and use engineering to create Green Storm Water Infrastructures models to reduce runoff at our school.

**Assessment:** After building and testing their design, students will write a [proposal](#) to the principal to persuade her to invest in adding a Green Stormwater Infrastructure to our school (rain barrel, rain garden, etc).

## Materials/Resources:

- Cardboard (lots of it), duct tape, tin foil, multiple sized containers (empty yogurt containers, recycled to-go containers, etc... for the green stormwater infrastructures), duct tape, moss, small gravel, pipe cleaners, straws, hot glue (lots of it!), popsicle sticks (really any kind of material kids can build and create with)
- [Investigating Green Stormwater Infrastructures](#)
- [Slides for student research jigsaw](#)
- [Notes Sheet for research](#)
- [Poster requirements](#)
- [Engineering a School Landscape Slides](#)
- [Proposal Outline/graphic organizer](#)
- [notetaking for students while they present](#)
- 1 [small round kiddie pool](#) to test their models and various "pollutants" to represent the many pollutants that normally occur. Ex. salt (for road salt), green sprinkles (grass clippings), soy sauce (oil), ground coffee (soil), sprinkles (trash), chocolate chips (pet

- waste), etc.
- [watering can](#) so you can make it slowly rain on their models
- Box cutters/scissors to cut cardboard

**Lesson Summary:** Students will learn about different types of green stormwater infrastructures and how they reduce/slow down run off. After doing a jig-saw research activity, students will engineer a model of the school complete with at least 4 different green stormwater infrastructures to improve our school campus. Students will then write a proposal to our principal to persuade her to add a green stormwater infrastructure to our campus.

## **Outline of Lesson**

### **Day 1- 5**

- Start with introducing pollutants, impervious surfaces, and the project using these [slides](#)
  - Key talking points- nonpoint vs point source pollution, types of pollution, impervious vs pervious surfaces, runoff, connection to water cycle
- Introduce students to the different types of green stormwater infrastructures- and then assign small groups each a different green stormwater infrastructure to research and teach the rest of the class about using these [slides](#), these [research/video links](#), and this [note taking guide](#). Students create posters to teach their peers. Here are the [poster requirements](#).
- Students take notes in their science journals as other students present using this [notetaking guide](#)

### **Day 6-12**

*(This is where I would borrow the watershed model from ECHO Resource Room and talk about pollutants and where they are found because we use this same method to test the student models)*

- Students are introduced to the engineering challenge-(in [slides](#)) to create a model of our school (I just googled an aerial photo of our school) and to incorporate 4 different green stormwater infrastructures. We brainstorm together as a class for different ways we can add structures to our model (referencing our notes from the poster presentations).
  - They are required to keep all the paved surfaces and the school dimensions the same. They are also not allowed to use permeable pavement for all the roads/ parking lots (students will often use sponges to replace the roads for permeable pavement and it just makes the model unstable because they have to cut it out the bottom of the cardboard and insert the sponge.)
  - All students start with the same blueprint.
  - They must clear their design with the teacher first before they start building.
  - The school building must be done first before adding anything else to their model.
  - If you use cardboard as the base, it is helpful to spray with a waterproof sealant. I have recently switched to using these [foam boards](#). However, it is absolutely possible to do this with just cardboard.
  - Students must come up with their own materials list for their infrastructures.

*This building phase can take 5+ days to complete depending on the length of your classes.*

### **Day 12-13**

- Engineering showcase and testing!

- We set up the kiddie pool with some water to represent our lake/river. Projects are placed at a slight angle to show/test run off into our kiddie pool lake. I use a milk crate and usually a large rock to prop it up at an angle so all the water will run down the model and test their infrastructures.
- We “pollute” their models (using safe/nontoxic examples to represent pollutants and we use the same ones that were used in the demo watershed model I borrow from ECHO).
- I fill a watering can with water and we have it “rain” on their models for 20 seconds. Students need to take before and after pictures and record their results using their school devices. This is used as qualitative data collection.

### **Day 14-16**

- After testing is completed for everyone, students are required to format a persuasive letter to our principal to invest in a green stormwater design they want to add to our school campus.
- Students use this [graphic organizer](#) to write their letter.

\*\* This year we are going to be asking for a rain barrel to add to our garden and the students will decorate/paint the barrel to add to our campus.\*\*